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34

APPLICATION OF THE LAWS OF HYDRAULICS

A column of air 16 m 51 in height at a temperature of 1000° produces a pressure per square meter of

or

$$= 0.277 \times 16.51 = 4.57 \text{ kg per square meter}$$

$$= 4.57 \text{ mm of water.}$$

Therefore, in order to impress upon the hot air emerging from the port a velocity of 18 m per second it is necessary to provide a pressure acting upon that air of 4.57 mm of water column. This is the hydrostatic pressure created in the regenerator chamber and the vertical uptakes, or flues leading to the port, which are filled with hot air.

If it is assumed that during the passage of the air through the regenerator checkerwork and through the uptake there is no loss of pressure due to friction or other causes the vertical height required to produce this pressure may be computed. The value found in this manner will evidently be too small, since actually the resistance and friction through the regenerator and uptake cannot be neglected.

Assuming that the air at the bottom of the regenerator has a temperature of 50° and the temperature at the heads is 1000°, the average temperature will be 525°. The hydrostatic pressure which this will give is

$$H = 4.57 = 7.5 \text{ m} \quad 1.29$$

from which the value of $H = 7.5 \text{ m}$.

Therefore the vertical height of the regenerator and the gas or air uptake should not be less than 7.5 m or thereabouts, as only a regenerator and uptake having a height greater than this will be able to supply the hydrostatic pressure sufficient to impress upon the air in the heads a velocity of 18 m per second.

The fundamental points of the mechanics of the circulation of

the gases in furnaces have now been stated. The following is a brief summary of the principles involved:

The chambers of furnaces filled with hot gases create in their upper parts a positive hydrostatic pressure which expends itself or is absorbed in impressing upon the hot gases the velocity necessary for their circulation in the furnace.

There are two causes which act to retard or absorb the velocity of the hot gases: